Claims

1. A computer-implemented method comprising:

   obtaining a set of data samples representing an image;

   generating a set of nodes in a generalized Gaussian quadrature; and

   performing an interpolation of the data samples using the nodes as interpolation points, wherein the interpolation is defined as a linear combination of a family of bandlimited orthogonal basis functions.

2. The method of claim 1, wherein the generalized Gaussian quadrature is selected in accordance with an accuracy requirement.

3. The method of claim 2, wherein a bandwidth of the generalized Gaussian quadrature is selected so as to optimize accuracy of the interpolation.

4. The method of claim 3, wherein the Gaussian quadrature is selected to have a number of nodes that optimizes accuracy of the interpolation.

5. The method of claim 1, wherein the family of bandlimited orthogonal basis functions includes a plurality of prolate spheroidal wave functions.

6. The method of claim 5, wherein the plurality of prolate spheroidal wave function includes at least one of an exact prolate spheroidal wave function and an approximate prolate spheroidal wave function.

7. The method of claim 1, wherein the generalized Gaussian quadrature is a generalized Gaussian quadrature for exponentials.

8. The method of claim 1, wherein the set of nodes in the generalized Gaussian quadrature is computed from zeros of a prolate spheroidal wave function.

9. The method of claim 1, wherein the image represents seismic measurements.

10. The method of claim 1, wherein the image is derived from medical imaging apparatus.

11. The method of claim 1, wherein the image is obtained from a camera.

12. The method of claim 1, wherein the data samples are arranged in proximity to nodes of a generalized Gaussian quadrature for exponentials.

13. A computer-implemented method comprising:

obtaining a set of data samples representing one or more physical measurements;

generating a set of nodes in a generalized Gaussian quadrature, wherein the generalized Gaussian quadrature is selected in accordance with given accuracy and bandwidth requirements; and

performing an interpolation of the data samples using the nodes as interpolation points, wherein the interpolation is defined as a linear combination of a family of bandlimited orthogonal basis functions.

14. The method of claim 13, wherein the physical measurements include seismic data.

15. The method of claim 13, wherein individual ones of the data samples are spatially related to other data samples according to a particular geometry.

16. The method of claim 15, wherein the geometry corresponds to a surface.

17. The method of claim 15, wherein the geometry corresponds to a path.

18. The method of claim 15, wherein the geometry is irregular.

19. The method of claim 13, wherein individual ones of the data samples are temporally related to other data samples.

20. A computer-implemented method comprising:

obtaining a set of data samples representing a signal;

generating a set of nodes in a generalized Gaussian quadrature, wherein the generalized Gaussian quadrature is selected in accordance with given accuracy and bandwidth requirements; and

performing an interpolation of the data samples using the nodes as interpolation points, wherein the interpolation is defined as a linear combination of a family of bandlimited orthogonal basis functions.

21. The method of claim 20, wherein the data samples have been sampled at a sampling rate that is less than a corresponding Nyquist rate for the signal.

22. The method of claim 21, wherein the data samples are aliased.